CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

RESOLUTION NO. R5-2003-0034

RESOLUTION APPROVING REVISED AMENDED REGIONAL TOXIC HOT SPOT CLEANUP PLANS FOR DIAZINON ORCHARD DORMANT SPRAY, URBAN PESTICIDES, AND IRRIGATION RETURN FLOW PESTICIDES

WHEREAS, in 1989, the California Legislature established the Bay Protection and Toxic Cleanup Program (Bay Protection Program) to: 1) provide protection for present and future beneficial uses of bay and estuarine waters of California, 2) identify and characterize toxic hot spots, 3) plan for toxic hot spot cleanup or other remedial or mitigation actions, and 4) develop prevention and control strategies for toxic pollutants that will prevent creation of new toxic hot spots or perpetuation of existing ones within the bays and estuaries of the state; and

WHEREAS, California Water Code (Water Code) Section 13394 required the State Water Resources Control Board (State Water Board) and the Regional Boards to develop Regional and Consolidated Toxic Hot Spot Cleanup Plans by 30 June 1999; and

WHEREAS, a Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans was adopted by State Water Board on 2 September 1998; and

WHEREAS, on 29 April 1999, the Regional Board approved a Regional Toxic Hot Spot Cleanup Plan that identified three toxic hot spots related to pesticides (Resolution No. 99-001). Previously, on 22 February 1999, the Regional Board had requested a variance to allow the Regional Board to address pesticide regulation for the three pesticide toxic hot spots under the Clean Water Act Section 303(d) Total Maximum Daily Load process instead of the Bay Protection Program; and

WHEREAS, on 17 June 1999, State Water Board adopted Resolution No. 99-065 adopting the Consolidated Statewide Toxic Hot Spot Cleanup Plan (Statewide Plan) and approving three site-specific variances to allow the Regional Board to address pesticide regulation under the Clean Water Act Section 303(d) Total Maximum Daily Load process; and

WHEREAS, in 1999, a lawsuit was filed by the San Francisco BayKeeper (now Deltakeeper) and Bill Jennings (petitioners) challenging, among other things, the site-specific variances for pesticides; and

WHEREAS, in October 2001 the Sacramento County Superior Court entered a judgment in favor of the petitioners and issued a writ of mandate directing that the site-specific variances for the pesticide toxic hot spots identified in the Statewide Plan be

vacated and set aside, and further directing that the Regional Board and State Water Board undertake the necessary actions to prepare and submit to the Legislature an amended cleanup plan for the pesticide toxic hot spots in compliance with Water Code § 13394; and

WHEREAS, on 15 November 2001, the State Water Board vacated and set aside the site specific variances in the Statewide Plan; and

WHEREAS, on 15 April 2002, the court approved a compliance schedule that required the Regional Board to adopt amended cleanup plans for the pesticide toxic hot spots by 31 December 2002 and further requires the State Water Board to adopt and submit an amendment to the Statewide Plan including these cleanup plans to the Office of Administrative Law by 1 September 2003; and

WHEREAS, after due notice and public hearing, the Regional Board on 5 December 2002 adopted amended cleanup plans through Resolution R5-2002-0200 and transmitted Resolution R5-2002-0200 to the State Board; and

WHEREAS, Resolution R5-2002-0200 reflected the Regional Board's desire to have the opportunity to consider revisions to the amended cleanup plans adopted on 5 December 2002 if the court-approved compliance schedule could be modified to permit such consideration; and

WHEREAS, the compliance schedule was thereafter modified to permit the Regional Board to consider revisions to the amended cleanup plans at its March 2003 meeting; and

WHEREAS, Regional Board staff prepared draft revised amended cleanup plans and, on 28 January 2003, notice was given to all interested persons of the availability of draft revised amended cleanup plans; and

WHEREAS, the Regional Board received comments from interested persons and prepared responses to those comments; and

WHEREAS, notice of a public hearing on the draft revised amended cleanup plans was sent to all interested persons and published in accordance with applicable law; and

WHEREAS, the Regional Board held a public hearing on 13 March 2003, for the purpose of receiving testimony on the draft revised amended cleanup plans; and

WHEREAS, the amended cleanup plans must also be adopted by the State Water Board, incorporated as an amendment into the Statewide Plan and approved by the Office of Administrative Law (OAL) before becoming effective; and

WHEREAS, the Regional Board finds that the draft revised amended cleanup plans were developed in accordance with Water Code section 13394.

THERFORE BE IT RESOLVED, that after considering the entire record, including oral testimony at the hearing, the Regional Board approves the revised amended cleanup plans as set forth in Attachment A; and

RESOLVED that the Executive Officer is directed to withdraw from the State Water Board the amended cleanup plans adopted on 5 December 2002 through Resolution R5-2002-0200 and to forward copies of the revised amended cleanup plans set forth in Attachment A to the State Water Board for consideration and incorporation into the Statewide Plan, in accordance with the requirements of Section 13394 of the California Water Code; and

RESOLVED, that if during the approval process the State Water Board or OAL determines that minor, non-substantive corrections to the language of the amendment are needed for clarity or consistency, the Executive Officer may make such changes, and shall inform the Regional Board of any such changes; and

I, THOMAS R. PINKOS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, Central Valley Region, on 13 March 2003

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THOMAS R. PINKOS, Executive Officer

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

BAY PROTECTION PROGRAM TOXIC HOT SPOT CLEANUP PLANS FOR

DIAZINON IN ORCHARD DORMANT SPRAY
DIAZINON AND CHLORPYRIFOS IN URBAN STORMWATER
CHLORPYRIFOS IN IRRIGATION RETURN FLOW

Revised Report

March 2003

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

BAY PROTECTION PROGRAM TOXIC HOT SPOT CLEANUP PLANS FOR DIAZINON IN ORCHARD DORMANT SPRAY DIAZINON AND CHLORPYRIFOS IN URBAN STORMWATER CHLORPYRIFOS IN IRRIGATION RETURN FLOW

March 2003

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Introduction – Bay Protection Toxic Hot Spot Cleanup Plans

The Bay Protection Toxic Hot Spot Cleanup Program is a statewide program that required Regional Boards to identify toxic hot spots and develop cleanup plans to address them. The Program was clearly structured to deal with both sediment and water column toxicity problems. However, most of the hot spots identified throughout the State addressed toxic sediment, where traditional cleanup activities such as burying, dredging and hauling could be used to remedy the problems. The three pesticide problems identified by the Central Valley Regional Water Quality Control Board (Regional Board) are seasonal water column problems that cannot be addressed by hauling away the water or underlying sediment. Instead, the cleanup plans must rely on controlling the amounts of the chemicals that reach surface waters entering the Delta. The cleanup plans for these hot spots must involve source control, either by reduction of the use of the chemicals or by implementation of use and management practices that reduce or eliminate the discharge of the insecticides into water bodies.

Three pesticide cleanup plans have been developed to address the hot spots that are caused by two commonly used organophosphate pesticides, diazinon and chlorpyrifos. These pesticides have been documented to cause toxicity to aquatic organisms in the Sacramento-San Joaquin River Delta. The three cleanup plans address three different sources of diazinon and chlorpyrifos found through monitoring conducted as part of the Bay Protection Program:

- Diazinon throughout the Delta as a result discharges from orchards that apply diazinon as a dormant orchard spray in the winter (Diazinon Dormant Orchard Spray Cleanup Plan).
- Diazinon and chlorpyrifos in stormwater runoff in the Stockton and Sacramento urban areas primarily as the result of residential and commercial uses (Urban Stormwater Pesticide Cleanup Plan).
- Chlorpyrifos in several sloughs and upland creeks in the Delta during the spring as a result of discharges of irrigation return flows containing chlorpyrifos (Irrigation Return Flow Pesticide Cleanup Plan).

These water quality problems will be addressed by controlling the loads of diazinon and chlorpyrifos entering the Delta in the major tributaries to the Delta and by controlling sources of chlorpyrifos immediately adjacent to the affected sloughs and creeks.

The cleanup plans for the agricultural related problems of dormant spray runoff and irrigation return flow require that Total Maximum Daily Loads (TMDLs) and a proposed Basin Plan amendment for controlling the riverine inputs be brought to the Regional Board by September 2003. Additional actions that may be needed to control inputs to local waterways within the Delta are required to be brought before the Board by September 2004. The cleanup plans for the dormant orchard spray and irrigation return flow require that the Basin Plan amendments include, at a minimum, numerical water quality objectives for both pesticides for the Rivers and Delta, a control program and time schedule for compliance with objectives, load allocations, and monitoring. The Basin Plan implementation program will be designed to assure that an array of management

practices are implemented that will result in concentrations of the pesticides being reduced below levels that are toxic in the Sacramento River, San Joaquin River and Delta waters. Basin Plan amendments typically take two to three years to be developed and considered by a regional board. The reason that the more compressed time schedules mentioned above can be met is that development of the basin plan amendments are already underway (they started two years ago). However, this time schedule cannot be further shortened because of requirements for public review and response to comments and CEQA.

Diazinon and chlorpyrifos occurring at toxic concentrations in stormwater runoff in the Stockton and Sacramento urban areas is primarily the result of residential and commercial uses. Over the next several years, reduction in the concentrations of the pesticides in urban creeks will result from agreements made between USEPA and the manufacturers of chlorpyrifos and diazinon to phase out virtually all urban uses of the pesticides. NPDES Permits adopted by the Regional Board in October and December 2002 covering the Stockton and Sacramento urban areas require monitoring to evaluate the effectiveness of the phase-out on eliminating toxicity in Delta waters, and requires additional control actions if toxicity persists.

These cleanup plans meet all the requirements of the Bay Protection Program and are consistent with State Board Bay Protection Cleanup Program Guidelines for the development of regional toxic hot spots cleanup plans[1].

[1] State Water Resources Control Board Water Quality Control Policy for Guidance on Development of Regional Toxic Hot Spot Cleanup Plans, Adopted and Effective September 2, 1998.

Diazinon Orchard Dormant Spray Cleanup Plan

Background[2]

The Regional Board determined that diazinon in orchard dormant spray runoff caused toxic conditions in the Sacramento-San Joaquin Delta that warranted identifying the entire Delta as a candidate high priority toxic hot spot in 1999. The Consolidated Hot Spot Cleanup Plan adopted by the State Water Resources Control Board (State Board) in Resolution No. 99-065 identified this candidate hot spot as a known toxic hot spot that required a cleanup plan.

Diazinon in Delta waterways, as well as many other Central Valley waterbodies (see table below), have been identified in the State Board's 303(d) list as a high priority problem and committed to developing a waste load allocation (TMDL) by the year 2004. This plan addresses the cleanup plan requirements of the Bay Protection Program and is consistent with the proposed actions and schedules of the 303(d) listing.

303(d) List for Diazinon

Waterbody	Affected size	Priority	TMDL End Date
Arcade Creek	10 miles	High	2003
Chicken Ranch Slough	5 miles	High	2003
Delta Waterways	48,000 acres	High	2004
Elder Creek	10 miles	Medium	2003
Elk Creek Grove	5 miles	Medium	2003
Feather River, lower	60 miles	High	2003
Five Mile Slough	1 mile	Medium	2012
Harding Drain	7 miles	Low	After 2015
Merced River Lower	60 miles	High	2006
Morrison Creek	20 miles	Medium	2003
Mosher Slough	2 miles	Medium	2012
Natomas East Main Drain	5 miles	Medium	2015
Orestimba Creek	10 miles	Medium	2010
Sacramento River (Red Bluff to Delta	30 miles	High	2003
Salt Slough	15 miles	Low	After 2005
San Joaquin River	130 miles	High	2003
Stanislaus River,	48 miles	High	2004

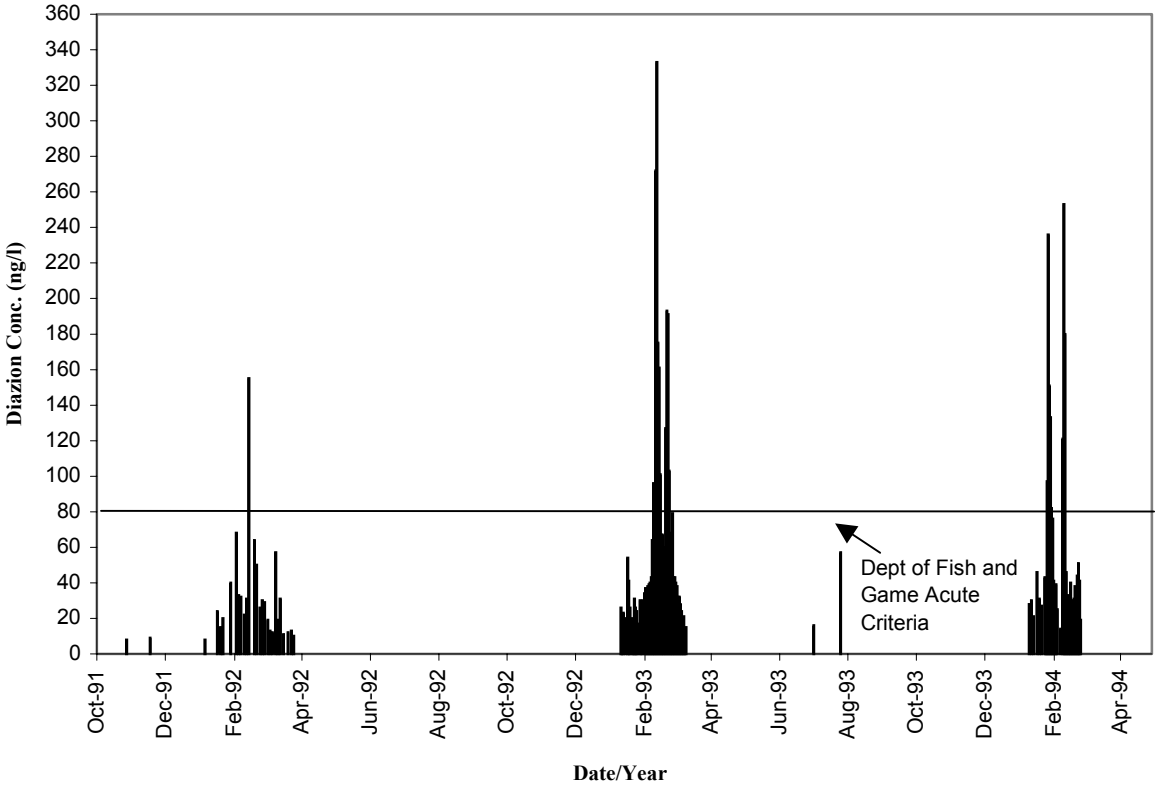
[2] The Bay Protection Program (California Water Code § 13394(a), (b) and (d)) requires that the regional boards develop cleanup plans that include a priority ranking of all hot spots (§ 13394(a)), a description of the hot spots (§ 13394(b)), and an assessment of the most likely source(s) of the pollutants present at the hot spot site (§ 13394(d)). The information presented in this section was previously developed and included in the Statewide Consolidated Toxic Hot Spot Cleanup Plan adopted by the State Board. It is substantively unchanged (with the exception of the updated 303(d) listing information) but is presented for essential background information purposes.

lower			
Strong Ranch Slough	5 miles	High	2003
Tuolumne River, lower	32 miles	High	2006

In the early 1990s, up to one million pounds of insecticide active ingredient was documented as being applied in the months January and February in the Central Valley on about half a million acres of dormant stonefruit and almond orchards to control boring insects (Foe and Sheipline, 1993). Diazinon accounted for about half the application. Numerous chemical studies and toxicity tests have measured diazinon in surface water samples in the Central Valley during winter months at concentrations toxic to sensitive invertebrates and exceeding the California Department of Fish and Game's criteria (See figure below; Foe and Connor, 1991; Foe and Sheipline, 1993; Ross, 1992 and 1993; Foe, 1995; Domagalski, 1995; Kratzer, 1997). Highest concentrations and longest exposures are typically found in small water courses adjacent to high densities of orchards. However, toxic concentrations of diazinon have been recorded after large storm events in the Central Valley's major waterbodies (Foe and Connor, 1991; Foe and Sheipline, 1993). The US Geological Survey and Regional Board traced pulses of diazinon from both the Sacramento and San Joaquin Rivers across the Delta in 1993 (Kuivilla and Foe, 1995). Toxic concentrations to the cladoceran invertebrate *Ceriodaphnia* were observed as far west in the Delta as Chipps Island, some 60 miles downstream of the City of Sacramento and the entrance to the Delta.

Concern was expressed that other contaminants might also be present in winter storm runoff from the Central Valley and contribute to invertebrate mortality. Therefore, in 1996, toxicity identification evaluations (TIEs) were conducted on three samples testing toxic in *Ceriodaphnia* toxicity tests from the San Joaquin River at Vernalis (Foe et al., 1998). The results confirmed that diazinon was the primary contaminant although other unidentified chemicals may also have contributed a minor amount of toxicity. The study was repeated in 1997 with samples taken further upstream in the Sacramento and San Joaquin watersheds in the hope of collecting water with greater concentrations of unknown toxicants thereby facilitating their identification. TIEs conducted on samples from Orestimba Creek in the San Joaquin Basin and from the Sutter Bypass confirmed diazinon as the primary toxicant (Foe at al., 1998). No evidence was obtained suggesting a second contaminant.

Diazinon Concentrations in the Sacramento River @ City of Sacramento



The criteria specified in the State Board Bay Protection Toxic Cleanup Program Guidance for determining what constitutes a high priority toxic hot spot requiring a cleanup plan includes consideration of aquatic life impacts, frequent exceedances of water quality objectives, the areal extent of the impairment, identification of sources and potential for natural remediation. Aquatic toxicity has been demonstrated to occur repeatedly through toxicity tests, TIEs and chemical confirmation. The Regional Board previously determined that high concentrations of diazinon, frequently detected in the Sacramento River, San Joaquin River and in the Delta were toxic and these waterbodies merited consideration as a high priority toxic hot spot. The Consolidated Hot Spot Cleanup Plan adopted by the State Board in Resolution No. 99-065 identified this Regional Board high priority toxic hot spot as a known toxic hot spot. More information supporting the staff recommendation to list diazinon from dormant orchard spray runoff as a high priority toxic hot sport may be found in the Statewide Consolidated Hot Spot Cleanup Plan tables (see pages 5-3 through 5-7).

Although the extent of impairments is widespread, the sources are limited to the single activity of dormant spray applications. This impairment will not be corrected by natural processes, and cannot be remediated like some sediment contamination problems through site cleanup. Whereas sediment contamination can be removed and treated, diazinon from dormant orchard spray results in a water column problem which requires an effective upstream source control program in order to remediated the hot spot.

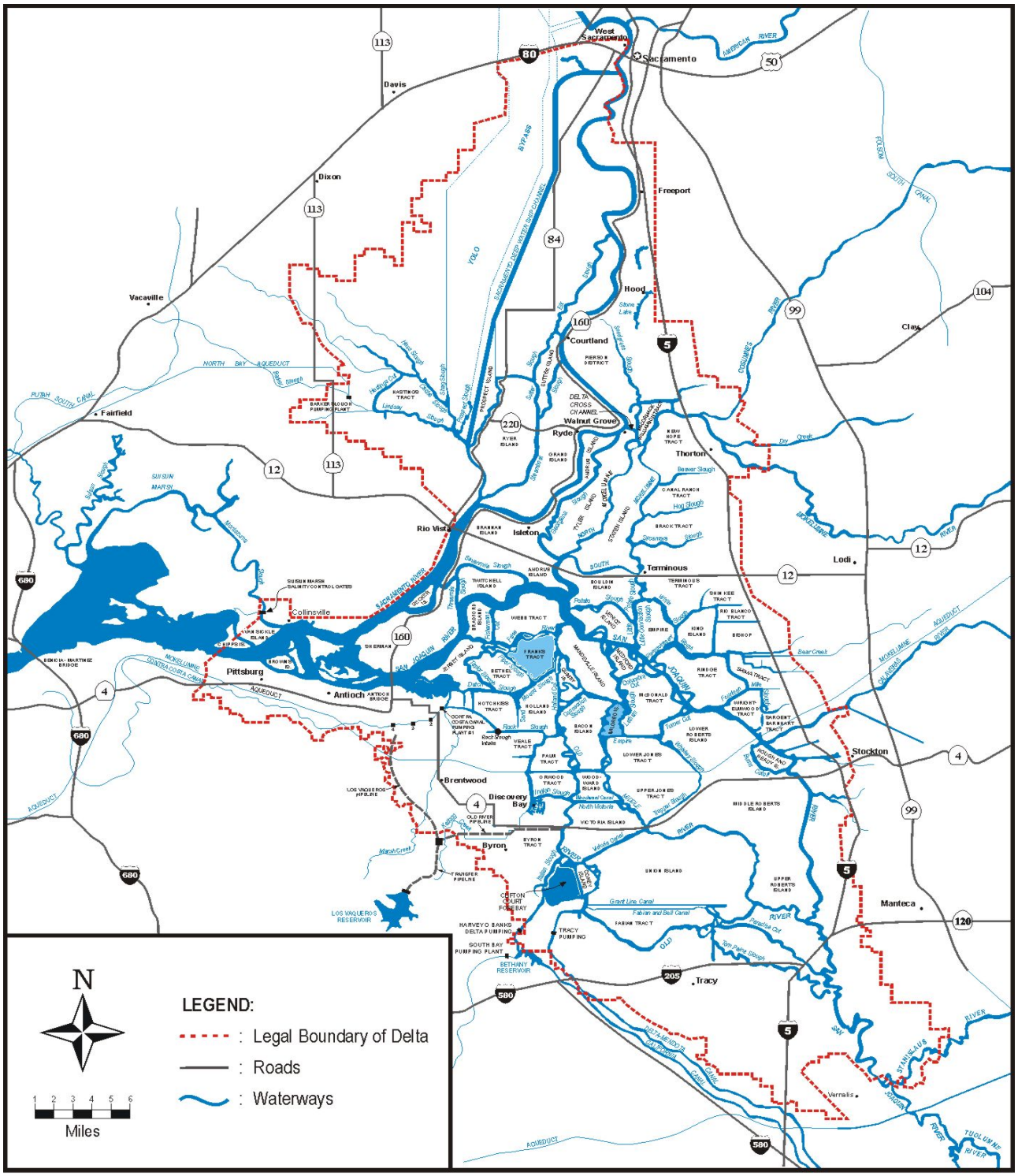
A. Areal Extent

Studies demonstrated that the potential areal extent of diazinon water column contamination from orchard runoff is variable year by year but can include most of the Sacramento-San Joaquin Delta in some years. The Delta is a maze of river channels and diked islands covering some 78 square miles of water area and 1,000 linear miles of waterway. See attached map.

B. Sources

Virtually every study investigating off-site movement into the Rivers and Delta have concluded that the primary source of diazinon in the winter is from agriculture (Foe and Connor, 1991; Foe and Sheipline, 1993; Ross, 1992 and 1993; Domagalski,1995; and Kratzer 1997). The only major use of diazinon in agricultural areas in the Central Valley during the winter is as a dormant orchard spray.

Due to the many variables affecting the offsite movement of dormant applications of diazinon, it is not known at this time the relationship between pesticides applied to orchards and the loads in the waterways. Determining the factors influencing the offsite movement of diazinon to waterways and identifying the areas contributing to the hot spot is essential not only for assessing responsibility and source but also for successful development and implementation of agricultural management practices. However, farmers are required to report all applications of diazinon to the County Agricultural Commissioner's Office and the total quantity of pesticide applied by individual counties is available from the Department of Pesticide Regulation.



Sacramento/San Joaquin River Delta
(Source: California Department of Water Resources)

C. Summary of Actions that have been Initiated by the Regional Board to Reduce Diazinon at Existing Hot Spot Sites and to Prevent the Creation of New Hot Spots (Cal. Water Code § 13394(h))

The Regional Board has been involved in activities to address water quality problems associated with diazinon in the Delta and tributaries to the Delta for more than 15 years. The Regional Board's involvement has included implementation of comprehensive monitoring programs, revision of CWA 303(d) listings of impaired waterbodies, revisions to NPDES permit specifications, and coordination with DPR, watershed groups and stakeholders.

Regional Board Monitoring

- Comprehensive monitoring program identified diazinon as a basin wide water quality problem, 1986-1994.
- Since 1994, the Regional Board has participated in cooperative monitoring efforts with DPR and others.

303(d) Listings of Impaired Water Bodies

- The Delta, Sacramento River, Feather River and San Joaquin River and several tributaries have been placed on the 303(d) list of impaired waterbodies for elevated concentrations of diazinon.
- Total Maximum Daily Loads (TMDLs) are required for all listed waterbodies
- The Regional Board has established time schedules to develop TMDLs for the rivers and Delta and has initiated meeting with stakeholders and interested parties.

NPDES Permit Revisions

- A letter was sent in 2002 to all significant NPDES Permittees requiring monitoring of effluent discharges and receiving waters for diazinon and chlorpyrifos.
- Waste discharge requirements for municipal wastewater discharges have been re-evaluated as the permits reach the five-year expiration date. Where monitoring data indicate that there is reasonable potential for diazinon or chlorpyrifos to cause receiving water toxicity, effluent limitation are included in the NPDES Permit. (For example, the April 2002 NPDES Permit renewal for the City of Stockton wastewater treatment plant included an effluent limitation for diazinon.)
- Stormwater permits for Sacramento and Stockton urban areas have been re-evaluated and strengthened to require monitoring and diazinon control programs to insure that urban sources do not contribute to the hot spot.

Watershed Management Initiative

- The Watershed Management Initiative (WMI) directs state and federal funds to the highest priority activities and to assure coordination with other agencies and parties.
- The Regional Board has identified diazinon as high priority water quality problem in the WMI.

CALFED and other Grant Programs

- The Regional Board has successfully obtained state and federal grant funding for management practice development projects.
- The Regional Board has also worked with CALFED to ensure that the Record of Decision included diazinon as a high priority problem that needs to be addressed.

Department of Pesticide Regulation Coordination

In 1997, the Department of Pesticide Regulation (DPR) and the State Board signed a management agency agreement (MAA) and a companion document, the Pesticide Management Plan for Water Quality (Pesticide Management Plan), These documents were developed, in part, to provide the framework for using each agency's authorities to effectively address water quality problems associated with pesticides. The Regional Board has worked with DPR to implement monitoring programs and to support programs that evaluate management practice effectiveness.

In February 2003 DPR placed dormant agricultural use pesticides containing diazinon in to formal reevaluation. In this reevaluation, registrants are required to identify (1) the processes by which dormant spray diazinon products are contributing to detections of diazinon in surface water that exceed water quality criteria recommended by the Department of Fish and Game, and (2) mitigation strategies that will reduce or eliminate diazinon in surface water. As it administers this reevaluation, DPR will coordinate with the Regional Board.

Watershed and Stakeholder Groups

The Regional Board has been working with DPR, interest groups and stakeholders to collect the information needed for development of the components of the TMDLs. The State's Nonpoint Source Program also funds active participation in many watershed groups working on pesticide issues, and state and federal grant projects that staff manage also allows staff to keep abreast with watershed/stakeholder activities. Staff has also partnered with other agencies and programs to maximize available resources for monitoring programs, computer models, workshops, and education and outreach efforts. The Regional Board has participated in the following stakeholder activities (by attending meetings or providing grant or technical assistance) that are related to the dormant spray problem.

- DPR has investigated several management practice alternatives. A study on orchard floor management as a means to reduce discharges of dormant sprays into

surface waterways has been completed (Ross *et al*., 1997) and investigations are continuing in a commercial orchard. For example, the University of California Statewide Integrated Pest Management Program is investigating orchard management practices and their effects on diazinon runoff in the dormant season.

- DPR partnered with the USGS and the Regional Board in 1999 to perform two years of intensive dormant spray season monitoring in the Sacramento River Watershed as part of their dormant spray program.

- Novartis (now Syngenta), the registrant of diazinon, distributed over ten thousand brochures over the past several years describing the water quality problems associated with dormant spray insecticides and recommending a voluntary set of best management practices (BMPs) to help protect surface waters.

- Novartis (now Syngenta) and Makhteshim-Agan of North America, Inc. ("MANA"), diazinon registrants, distributed over ten thousand brochures over the past several years describing the water quality problems associated with dormant spray insecticides and recommending a voluntary set of best management practices (BMPs) to help protect surface waters.

- Dow AgroSciences and MANA are conducting a study to characterize the benthic communities and physical habitat in Arcade Creek and Orestimba Creek. In addition to monitoring, Dow AgroSciences and MANA are developing a pesticide transport model integrating pesticide inputs with stream transport and fate.

- DowAgro Sciences LLC and Novartis, the registrants of chlorpyrifos and diazinon, have undertaken a study in Orestimba Creek to identify specific agricultural use patterns and practices which contribute the majority of off-site chemical movement into surface water.

- DowAgroSciences is also conducting a study to characterize the benthic communities and physical habitat in Arcade Creek and Orestimba Creek. In addition to monitoring, Dow Agro Sciences is developing a pesticide transport model integrating pesticide inputs with stream transport and fate.

- In 1997 the U.C. Statewide Integrated Pest Management Project (IPM) was awarded a two year grant by the State Water Resource Control Board to identify alternate orchard management practices, provide outreach and education on these practices to the agricultural community, and design and initiate a monitoring program to assess the success of the new practices. CALFED has funded a multi-year follow-up study with the same general objectives and the formation of a Steering Committee.

- The California Dried Plum Board (CDPB) has several programs that will lead to reduced pesticide use including the Biologically Integrated Prune Systems (BIPS) program, which hopes to achieve the reduction or elimination of organophosphate dormant sprays deriving from a strong outreach component that includes

demonstration sites and "hand-on" training for growers and pest control advisors (PCAs). Funds were also acquired from the NRCS Environmental Quality Incentives Program (EQIP) to study management practices reducing the offsite movement of pesticides from orchards.

- The Biorational Cling Peach Orchard Systems (BCPOS) project has the same goals as the BIPS program, except that it focuses on primarily on pests in cling peach orchards.

- The Almond Board of California has conducted research on BMPs to minimize the movement of pesticides off-site, softer insecticides, and almond varieties with greater pest resistance. In addition, the Almond Board has participated in a survey to set a baseline measurement of IPM practices in use and assess pest control practices among almond growers and Pest Control Advisors. The Almond Board has also produced a Pest Management Strategic Plan developed with almond growers, pest control advisors and UC Extension representatives to plan for the transition away from at-risk pesticides, particularly OPs.

- Biologically Integrated Orchard Systems (BIOS) program pioneered community-based efforts to implement economically viable, non-conventional pest management practices. It emphasizes management of almond orchards in Colusa, Merced, Madera, and San Joaquin and Stanislaus counties in ways that minimize or eliminate the use of dormant spray insecticides.

- The Colusa County Resource Conservation District (RCD) is leading a runoff management project in the Hahn Creek watershed targeting management practices that reduce runoff from almond orchards, thereby reducing pesticide loads in the creek. Outreach and demonstration sites are part of this project.

- The Glenn County Resource Conservation District (RCD) has an EQIP funded program that educate producers in Glenn County about existing water quality regulations, wetland determinations, and ground water quality monitoring.

- The Glenn County Resource and Planning Department leads the Glenn County Surface Water Stewardship Project which is a voluntary program promoting management measures to address the off-site movement of pesticides, nutrients and sediment from agricultural sources.

- The Natural Resources Conservation Service-Colusa Office was recently awarded over $100,000 of EQIP funds for cost sharing and incentive payments for conservation practices.

- The Natural Resources Conservation Service, Stanislaus Office, has obtained $700,000 of EQIP funds to address livestock production practices and implementation of reduced-risk pest management practices.

- The Coalition for Urban/Rural Environmental Stewardship (CURES) has provided grower and agricultural consultant education and outreach on pesticide runoff problems in surface water and BMPs to mitigate these problems.

- The Nature Conservancy initiated a voluntary program of reducing OP pesticides and is enrolling more prune growers in the BIPS project as it proceeds with its Phelan Island restoration project in the Sacramento Valley.

- Ducks Unlimited has conservation easements for agricultural land and provides information to local communities on how key habitat areas such as wetlands and riparian systems can assist them in dealing with water management issues, both water quality and flood protection.

- The University of California at Berkeley has received CALFED funds to assess the effect of pesticides on fish and their food sources in the Sacramento/San Joaquin Delta.

- The OP Focus Group, a subgroup of the Sacramento River Watershed Program, has developed the "Water Quality Management Strategy for Diazinon." The OP Focus Group has successfully applied for and been awarded four grants totaling over $1 million to implement the strategy. Demonstration farms and a grower outreach campaign are key elements of the projects targeting almond, dried plum and peach growers who farm in the Sacramento and Feather River watersheds.

D. Preliminary Assessment of Actions Required (Cal. Water Code § 13394(f))

The entire Delta was determined to be a hot spot from inputs of diazinon resulting from dormant orchard spray runoff. The impairment is seasonal water column toxicity that occurs during periods of winter stormwater runoff. Diazinon is applied in the winter, usually December through February, as a dormant spray to orchards to control various insect pests. The pesticide reaches surface waters when subsequent storms wash pesticides off the fields into the rivers. Another potential source is direct deposits to surface waters during the pesticide application. Also, some of the pesticides that are applied to fields volatilizes and are deposited in surface water in subsequent rainfall events.

This cleanup plan is designed to address the seasonal water column toxicity problem that occurs as a result of applications of diazinon as a dormant spray. This cleanup plan, and the two cleanup plans that follow, are different than cleanup plans developed in other parts of the state to remediate toxic sediment, a problem that can be addressed by traditional cleanup activities such as burying, dredging and hauling to remedy the problems. This seasonal water column hot spot cannot be addressed by hauling away the water or the underlying sediment. The cleanup plan must rely on controlling the amounts of the chemicals that reach surface waters entering the Delta. Therefore, this cleanup plan and the two cleanup plans that follow, focuses on source control, either by reduction

of the use of the chemicals or by implementation management practices that reduce or eliminate the discharge of diazinon into surface waters.

This cleanup plan identifies actions the Regional Board may take to establish a regulatory framework that will require implementation of a suite of management practices or measures to assure dormant orchard spray discharges do not continue to cause or contribute significantly to the hot spot. The regulatory frameworks and associated costs outlined in this cleanup plan are included here for informational purposes. These are examples of potential actions the Board may take when implementing TMDLs and Basin Plan Amendments and should not be construed as initiating or dictating action at this time. This cleanup plan does set a time schedule for the Regional Board to make important regulatory revisions to the Basin Plan[3].

This cleanup plan establishes a time schedule for the Regional Board to adopt TMDLs, and to adopt Basin Plan amendments to implement the TMDLs. This cleanup plan requires that the Regional Board approve the TMDLs and consider amendments to the Basin Plan by September 2003 for the Sacramento River and San Joaquin River and by September 2004 for the Delta and adopt amendments to the Basin Plan no later than December 2003 and December 2004 respectively.

[3] The time schedules set forth herein express the Board's intent and may need to be revised depending on future funding levels and developments that occur in the separate public proceedings for considering adoption of TMDLs and Basin Plan amendments.

Basin Plan Amendment Schedule

Waterway	Schedule	Date
Sacramento/ San Joaquin Rivers	Technical reports circulated for peer review, includes preliminary staff analysis on water quality objectives and implementation alternatives	March 2003
Sacramento/ San Joaquin Rivers	Proposed basin plan amendments given to the Regional Board for consideration. Amendments will include: – water quality objectives for diazinon; – an implementation program and framework; – a compliance time schedule; – a monitoring program; and – other required TMDL elements.	September 2003
Sacramento/ San Joaquin Rivers	Adopt Basin Plan Amendments	December 2003
Delta	Technical reports prepared that includes preliminary staff analysis on water quality objectives and implementation alternatives	September 2003
Delta	Proposed Basin Plan amendments given to the Regional Board for consideration. Amendments will include: – water quality objectives for diazinon; – an implementation program and framework; – a compliance time schedule; – a monitoring program; and – other required TMDL elements.	September 2004
Delta	Adopt Basin Plan Amendments	December 2004
Delta and Upstream	Monitor diazinon concentrations in surface waters in the Delta and upstream inputs.	Annually

TMDLs will be developed for the diazinon in the Sacramento River, San Joaquin River and Delta. The TMDLs will include a TMDL staff report that describes the impairment, identifies an appropriate water quality target, determines the loading capacity and allocates loads (including a margin of safety). The TMDL load allocations are implemented by amending the basin plan to include the regulatory provisions of the TMDL (water quality objective, load allocations and margin of safety) and an implementation program and time schedule. The TMDLs are adopted when the Regional Board adopts the basin plan amendments that implement the load allocations. The cleanup plan requires that these amendments contain:

- numeric water quality objectives for diazinon for the Sacramento River, the San Joaquin River and the Delta
- load allocations including a margin of safety
- a time schedule for compliance with the objectives and allocations

- a program of implementation that is based on the regulatory options contained in Porter-Cologne (i.e., individual WDRs, areawide or group WDRs, conditional prohibitions, conditional waivers)
- monitoring requirements to evaluate program effectiveness

Basin Plan amendments and TMDLs typically take two to three years to develop. The reason that the proposed time schedule can be met is that development of the TMDL and Basin Plan amendments are already underway (they started two years ago). However, the time schedule set forth above cannot be shortened further, because of requirements for public review and response to comments and CEQA.

The Basin Plan amendments that are required by the cleanup plans will implement actions previously missing (BMPs and other source control options) in order to correct the hot spots. The Regional Board cannot specify what specific practices should be implemented. The Regional Board can specify through a Basin Plan amendment what water quality conditions need to be met, by when they must be met, and what type of information must be submitted to determine compliance.

The implementation framework that will be included in the Basin Plan will be based on Regional Board regulatory authorities that are included in Porter-Cologne. Porter-Cologne describes three primary mechanisms to regulate the discharge of waste:

1. prohibiting the discharge of waste (a "prohibition" under § 13243 of Porter-Cologne)
2. issuance of requirements for the discharge of waste (waste discharge requirements (WDRs) under § 13263 of Porter-Cologne)
3. waiver of waste discharge requirements (a "waiver" under § 13269 of Porter-Cologne)

Prohibitions and waivers of waste discharge requirements can be developed that specify conditions under which discharges may be allowed. The conditions can include a wide array of provisions geared toward assuring that waste discharges do not cause water quality problems.

E. Estimated Costs of Implementing Control Program (Cal. Water Code § 13394(c))

The primary costs of implementing this program are 1) costs to the Regional Board to develop and process the Basin Plan amendments, including monitoring and preparation of staff reports, 2) costs to the Regional Board to implement the regulatory program that is developed through the Basin Planning process, 3) costs to other entities (DPR, agricultural commissioners, watershed groups, irrigation districts, etc.) that would be part of the regulatory framework, 4) cost to growers to implement practices to reduce pesticide runoff and to submit information required as part of the regulatory program, 5) costs associated with the continuing need to develop and evaluate management practices, and 6) monitoring costs to evaluate program effectiveness. In the following table, costs

are estimated for these 6 elements. More detailed information on the costs is presented following the table for each of the elements.

Task	Cost
Regional Board staff costs to develop Basin Plan proposal	$400,000 FY 2002-2003* $200,000 FY 2003-2004*
Regional Board costs to oversee (Depends on regulatory framework)	$180,000-$600,000 annually
Costs to other entities to oversee	$0-$300,000 annually
Costs to Growers	
Implementation of practices (Depends on alternatives selected)	$3-$164 per acre additional cost
Regulatory Compliance	$1,000-$4,060 per grower annually
Continued practices development	$100,000 to $1,000,000 per year
Monitoring for program effectiveness	$100,000/yr in Delta only

*Costs included in present budget

Regional Board Staff Costs to Develop Basin Plan Amendment

Although the Regional Board has worked on this pesticide problem for many years, it was not until 1998 that resources were specifically designated for this program. The cost estimates presented here are for FY 2002-2003 and FY 2003-2004. Basin Plan amendments are scheduled for consideration in September 2003 for the Sacramento River and San Joaquin River and September 2004 for the Delta. It is estimated that the costs for FY 2002-2003 would be about $400,000 and the costs for FY 2003-2004 would be about $200,000. The information is excerpted from program workplans. The cost estimates include staff time to develop the amendment package, including evaluating alternative water quality objectives and implementation frameworks and costs associated with monitoring and analysis of monitoring information. The Regional Board has resources budgeted to conduct the monitoring and the planning needed to support development of the Basin Plan amendments.

Regional Board Costs of Regulatory Oversight

As has been previously indicated, the Regional Board has three primary mechanisms that could be used to regulate the discharge of waste from agricultural sources: 1) prohibiting the discharge of waste (a "prohibition" under § 13243 of Porter-Cologne); 2) issuing requirements for the discharge of waste (waste discharge requirements (WDRs) under § 13263 of Porter-Cologne); and 3) waiving waste discharge requirements (a "waiver" under § 13269 of Porter-Cologne. Therefore, we have presented a range of cost estimates that account for the relative level of Regional Board oversight that would be required under the different options. The estimates are based on costs associated with previous

Regional Board regulatory efforts for rice pesticide in the Sacramento River watershed and selenium in the San Joaquin River watershed and information presented in the Regional Board staff report on agricultural waivers that was presented to the Regional Board in December 2002. However, these costs are based on the development of regulatory oversight for one parameter (diazinon) for one time of the year (dormant season). The oversight will be less time consuming and costly than a more comprehensive regulatory program for multiple parameters such as those outlined in the agricultural waivers. The estimated annual cost to the Regional Board to implement this program would range from about $180,000 to $600,000, depending on which regulatory framework is used. Following is more detailed information about each alternative.

For purposes of these cost estimates, we assume that there are about 600 growers that apply diazinon in the Delta and watersheds tributary to the Delta. If individual waste discharge requirements were used, we assume that it would take one staff to handle 100 permits. Typical annual staff costs average about $100,000. This would include activities associated with adopting waste discharge requirements over a 5 year period for the 600 growers that apply diazinon as a dormant orchard spray, review of information and monitoring reports submitted by dischargers and doing a baseline amount of inspections, monitoring and enforcement. The annual cost would be about $600,000 (3 staff x $100,000 to adopt WDRs and 3 staff x $100,000 to review information, monitor, inspect and enforce).

The costs for the Regional Board to use general WDRs (assumes one set of WDRs covers entire Bay-Delta watershed) would be less expensive than using individual WDRs because we assume that it would take less staff effort to develop and adopt one general WDR rather than 600 separate WDRs. We assume that a similar level of activity would be needed to review information and monitoring reports submitted by dischargers and to perform a baseline number of inspections, monitoring and enforcement (compared to individual WDRs), because there still are the same 600 dischargers to work with. Therefore, the annual costs are estimated to be about $300,000 annually (3 staff x $100,000).

The costs to the Regional Board to use areawide WDRs (separate WDRs that covers smaller sub-watersheds within the larger Bay-Delta watershed) would be slightly less than using general WDRs because we assume that some watershed groups, irrigation districts or other entities would be formed to take responsibility for managing and digesting information developed by individual growers. The Regional Board would therefore need to work with a relatively small number of entities, instead of 600 individual growers. This would reduce Regional Board oversight costs, but there would be additional costs to entities accepting responsibility for the areawide waste discharge requirements. The annual costs are estimated to be about $180,000. There would be additional costs to entities participating in the program.

Costs to the Regional Board to use a conditional waiver or prohibition would be similar to a general WDRs if the Regional Board works with all 600 growers or would be similar to the areawide WDRs if the growers formed watershed groups.

Cost to Other Entities for Regulatory Oversight

We estimate that the costs to other entities (DPR, agricultural commissioners, watershed groups, irrigation districts, etc.) would range from almost nothing to about $300,000 annually depending on the alternative selected.

Cost to Growers

There are three types of costs to the grower: 1) the cost to implement practices to reduce pesticide runoff, 2) the cost associated with gathering and submitting information to fulfill waste discharge requirement or other conditions and 3) any WDR permit fee that might be required.

Cost of Practice Implementation

The choice of alternative practices to be implemented will be up to individual growers. Valley-wide implementation costs will be dependent on the mix of practices selected. Several practices which reduce the quantity of pesticide applied result in a cost savings over time, however this discussion will focus on the costs known to incur from altering pest management practices. The following cost estimates are presented to demonstrate the range of different potential alternative practices that could be implemented.

Costs are estimated for four pest management scenarios and compared to the current practice. The pest management and agronomic practices presented here are all considered "viable", that is, they offer favorable levels of pest control efficacy when compared the status quo. Most of these pest management and agronomic practices have been recommended or at least studied by the University of California Integrated Pest Management Program (UCIPM), and are considered to be effective both for controlling pest damage and for reducing diazinon runoff from orchards. (Zalom et al, 1999)

The individual pest management practices and their costs are from a study conducted by the Statewide UCIPM Project, the Water Resources Center, and the Ecotoxicology Program at UC Davis (Zalom, et al. 1999), funded by the State Board.

The most common current pest management practice is treating orchards with dormant oil (DO) and diazinon in the winter to control PTB, SJS, aphids, and mites, and reduce the need for in-season applications of other pesticides to control these pests. The following four alternative scenarios were evaluated, using the cost information presented in the documents previously mentioned: 1) dormant oil combined with an in-season application of some pesticide, 2) dormant oil with Bt and/or spinosad, 3) biological controls combined with cover crops and buffer strips with no pesticide applications, and 4) dormant oils, in-season use of pyrethroids, and in-season pesticides as needed.

It was estimated that applications of dormant oil combined with some in-season applications of pesticides of low risk, such as neem oil, would cost about $3 per acre more than the current practice of applying DO and diazinon. It was

estimated that applications of dormant oil, and Bt at bloomtime/or in-season spinosad dormant oil applications would cost about $164 per acre more than current preferred practices. It was estimated that use of biological controls, combined with cover crops and vegetative buffer strips (an no pesticides) would cost $132 per acre more than the current preferred practices. It was estimated that use of dormant oils with dormant applications of pyrethroids, in-season use of pesticides and use of cover crops, buffers, and other measures to reduce or eliminate field runoff, would cost $92 per acre more than current preferred practices.

Cost of Regulatory Compliance

If use of individual WDRs is the regulatory framework selected, each grower could be required to submit a filing fee. Considering the existing filing fee schedule and category descriptions, staff estimates that annual filing fees would be about $2,025. We assume that monitoring, reports and other information would need to be submitted by all growers. We estimate that the cost for each grower to submit information required to satisfy the WDRs would be about $2,035 annually, for a total of $4,060 a year. We assume that other options that would rely on formation of subwatershed groups to coordinate activities would cost less because the level of detail submitted from each grower would not be as great and there would be savings on implementing areawide monitoring programs rather than having monitoring at each orchard. In the event that waste discharge requirements are waived, all or part of the fees collected will be returned to the discharger, in accordance with Water Code section 13260(e) and 23 California Code of Regulations (CCR) 2200.4. However, the filing fees may not be required and could be subtracted as a cost. We estimate that using a watershed approach could cost as little as about $1,000 per grower annually.

Although there are costs of implementing this cleanup plan, the benefits of remediation include the protection of beneficial uses in the Delta. Currently the high concentrations of diazinon in the Delta are impacting the estuarine habitat (EST), migration of aquatic organisms (MIGR), spawning, reproduction and/or early development (SPWN), warm freshwater habitat (WARM), cold water habitat (COLD), water contact recreation (REC-1), non-contact recreation (Rec-2), and commercial and sport fishing (COMM) beneficial uses. Implementation of this plan will minimize or eliminate negative impacts on these uses. For more information on the benefits of restoring beneficial uses, see Table 1 in Volume 1 of the State Board's Toxic Hot Spots Cleanup Plan.

F. Estimate of Recoverable Costs from Potential Dischargers (Cal. Water Code § 13394(e))

The Regional Board, DPR and other agencies and parties have spent considerable resources developing the information to support this cleanup plan. These costs are not recoverable. As has been mentioned in the previous section, the cost of implementing the cleanup plan will be largely borne by the farmers using alternative practices and the regulatory agencies that must oversee control program implementation.

Regulatory oversight costs could be recovered if waste discharge requirements are part of the regulatory framework that is developed. If individual requirements are issued approximately $1.2 million could be recovered annually. Costs recovered by areawide or general permits would be dependent on the population covered by the permit. In the event that waste discharge requirements are waived, the Regional Board could elect to withhold sufficient funds collected with a filing of waste discharge to cover the actual staff time spent reviewing the report of waste discharge (as set forth in the California Code of Regulations). These costs were estimated by assuming that there are about 1000 orchards in the Sacramento and San Joaquin River watersheds that apply diazinon or some other alternative as a dormant orchard spray, assuming that the Regional Board would have to deal with all of them, and using the existing fee schedule to estimate the appropriate fee that would be applicable (in this case $2,025).

G. Two Year Expenditure Schedule Identifying Funds to Implement the Plan That Are Not Recoverable from Potential Dischargers (Cal. Water Code § 13394(g))

The Regional Board has a TMDL budget and a workplan that includes resources to monitor and develop the Basin Plan amendment proposals for the Sacramento River and the San Joaquin River in FY 2002 and 2003. Resources are also earmarked for FY 2003-2004 for completion of the Basin Plan amendments for the Delta.

Resources to support the Regional Board regulatory framework have not been identified and are dependent on what regulatory framework is chosen. If WDRs are used, then the program can be supported by WDR fees. If other options are used, funding sources will need to be identified. One option may be to request budget augmentations. Most of the costs to the Regional Board and other regulatory entities would occur beyond the two year budget outlook included under this section, since the Basin Plan amendments will not be completed until 2004.

Costs of implementation practices will primarily be borne by growers. However, there are many cost sharing (NRCS Environmental Quality Incentives Program (EQIP)) funds available to defray the costs associated with implementing new management practices. Additionally, several of the possible alternatives would result in cost savings. There are also several state and federal grant programs available to conduct research and monitoring to analyze management practice implementation, water quality improvement and management practice development, as well as education and outreach projects. These funding sources include the Clean Water Act Sections 319(h) and 205(j), Proposition 13 (including the Pesticide Research and Investigation of Source, and Mitigation (PRISM) Program), 40 and 50 funds, and the CALFED Bay-Delta Program.

Urban Stormwater Pesticide Cleanup Plan

Background[4]

The Regional Board determined that diazinon and chlorpyrifos in urban stormwater runoff caused toxic conditions in the Sacramento-San Joaquin Delta that warranted identifying several Delta back sloughs and creeks collectively as a candidate high priority toxic hot spot. The Consolidated Hot Spot Cleanup Plan adopted by the State Board in Resolution No. 99-065 identified this candidate hot spot as a known toxic hot spot. Diazinon and chlorpyrifos from urban runoff have also been noted in the Central Valley Region's 303(d) list as water quality impairments in Delta back sloughs and creeks. This cleanup plan addresses the cleanup requirements of the BPTCP and is consistent with the proposed actions and schedules of the 303(d) listing.

Three hundred and forty thousand pounds of diazinon and seven hundred and seventy five thousand pounds of chlorpyrifos active ingredients were used in landscape and structural pest control in California in 1994 for control of ants, fleas and spiders (Scanlin and Cooper, 1997; Department of Pesticide Regulation, 1996). However, these figures do not include homeowner purchases and likely underestimates total use by about one half. In February and again in October 1994 *Ceriodaphnia* toxicity test mortality was reported in Morrison Creek in the City of Sacramento and in Mosher Slough, 5 Mile Slough, Calaveras River, and Mormon Slough in the City of Stockton (Connor, 1994; 1995). All these water bodies are within the legal boundary of the Delta. A modified phase I TIE, conducted on samples from each site, implicated metabolically activated pesticide(s) (such as diazinon and chlorpyrifos) as responsible for the toxicity. Chemical analyses demonstrated that diazinon and occasionally chlorpyrifos were present at toxic concentrations. A phase III TIE was conducted on water collected from Mosher Slough on 1 May 1995 that confirmed that the primary cause of acute toxicity was a combination of diazinon and chlorpyrifos.

Similar invertebrate toxicity test results coupled with TIEs and chemical analysis from the San Francisco Bay Area suggest that diazinon and chlorpyrifos may be a regional urban runoff problem (Katznelson and Mumley, 1997). This finding prompted the formation of an Urban Pesticide Committee (UPC). The UPC is an ad hoc committee formed to address the issue of toxicity in urban runoff and wastewater treatment plant effluent due to organophosphate insecticides, in particular diazinon and chlorpyrifos. The UPC is composed of staff from the U.S. EPA, the San Francisco and Central Valley Regional Water Quality Control Boards, DPR, Novartis and Dow Elanco, municipal storm water programs, the Bay Area Stormwater Management Agencies Association, County Agricultural Commissions, wastewater treatment plants, the University of

[4] The Bay Protection Program (California Water Code § 13394(a), (b) and (d)) requires that the regional boards develop cleanup plans that include a priority ranking of all hot spots (§ 13394(a)), a description of the hot spots (§ 13394(b)), and an assessment of the most likely source(s) of the pollutants present at the hot spot site (§ 13394(d)). The information presented in this background section was previously developed and included in the Statewide Consolidated Toxic Hot Spot Cleanup Plan adopted by the State Board. It is substantively unchanged but is presented for essential background information purposes.

California and consultants. The members of the UPC are committed to working in partnership with the various stakeholders to develop effective measures to reduce the concentrations of organophosphate insecticides in urban runoff and wastewater treatment plant effluent.

In conclusion, a combination of toxicity test, chemical and TIE work demonstrate that diazinon and chlorpyrifos are present in urban stormwater runoff discharged to urban creeks and back sloughs around the cities of Sacramento and Stockton at concentrations toxic to sensitive invertebrates. The diazinon appears to be primarily from urban sources, although agricultural orchard use may also be an important source. Chlorpyrifos appears to be predominately of urban origin but the impacts from agricultural use need to be evaluated. Similar results from urban sites in the Bay area indicate that pesticide storm runoff is a widespread problem.

The Regional Board monitoring focused on *Ceriodaphnia* toxicity tests, TIEs and water column chemistry because these measures of aquatic toxicity were specifically identified in the BPTCP as tools that could be used to define toxic hot spots. The use of *Ceriodaphnia* in the BPTCP as an indicator of aquatic toxicity was an innovative and sound approach. An analysis of 49 independent studies (U.S. EPA, 1999) concluded that the *Ceriodaphnia* test has been a particularly reliable predictor of instream biological impacts. In 1995, the Society for Environmental Toxicology and Chemistry assembled a panel of experts to analyze the question of how reliably the results of laboratory single species tests (such as the U.S. EPA *Ceriodaphnia* toxicity test) predict aquatic population responses. The panel concluded that, "it is unmistakable and clear that when the U.S. EPA toxicity test procedures are used properly, they are reliable predictors of environmental impact provided that the duration and magnitude of exposure are sufficient to effect resident biota" and that "a strong predictive relationship exists between ambient toxicity and ecological impact."

Bay Protection Toxic Cleanup Program Guidance prepared by the State Board specifies how to determine what sites or situations should be designated as high priority toxic hot spots (cleanup plans are required for high priority hot spots). The criteria for making this determination for water column toxicity includes consideration of aquatic life impacts, exceedances of water quality objectives, the areal extent of the impairment, identification of sources and potential for natural remediation. Aquatic toxicity has been demonstrated to occur repeatedly through toxicity tests, TIEs and chemical confirmation. The extent of impairments from urban pesticide discharges is relatively widespread. This impairment will not be corrected by natural processes, however many of the urban uses are being phased out as a result of a December 2000 agreement between U.S. EPA and manufacturers of diazinon and chlorpyrifos.

In 1999, the Regional Board determined that diazinon and chlorpyrifos in urban runoff caused toxic conditions in numerous back sloughs in the vicinity of Sacramento and Stockton that warranted identifying these sloughs as a candidate high priority toxic hot spot. In making this determination, the Regional Board specifically concluded that the pattern of pesticide detections observed in the sloughs was frequent and clearly fit the definition of a toxic hot spot. The Consolidated Hot Spot Cleanup Plan adopted by the

State Board in 1999 in Resolution No. 99-065 identified this candidate hot spot as a known toxic hot spot. The tables in the Statewide Consolidated Cleanup Plan (see 5-3 through 5-7) summarize the determinations that support the staff recommendation that the back sloughs and creeks named above be listed as a high priority toxic hot spot for chlorpyrifos and diazinon.

A. Areal Extent

The potential threat posed by diazinon and chlorpyrifos in urban storm runoff is localized to Morrison Creek in the City of Sacramento and Mosher Slough, 5 Mile Slough, the Calaveras River, and Mormon Slough in the City of Stockton. Together the areal extent of impairment may be up to 5 linear miles of back sloughs within the legal boundary of the Delta. In addition, runoff from urban areas in tributaries to the Delta contributes to the overall loads entering the Delta during storm events.

B. Sources

Detailed information on urban sources is not available for the Central Valley. However, in a Sacramento Stormwater Management Report (Busath, 2001), three sources of pesticides in Sacramento urban creeks were identified: 1) unreported residential and commercial applications, 2) reported applications by licensed pesticide applicators, and 3) pesticides transported from agricultural applications. This report and others (personal communication, Val Connor) suggest that diazinon in rainfall is a significant source in the Central Valley. Monitoring and pesticide use surveys in the Sacramento area confirm Bay area findings (Scanlin and Feng, 1997) that residential areas were a significant source but runoff from commercial areas may also be important.

It is not known what portion of the diazinon and chlorpyrifos found in creeks is attributable to use in accordance with label directions versus improper disposal or over application. However, a preliminary study of runoff from residential properties suggests that concentrations in creeks may be attributable to proper use (Scanlin and Feng, 1997).

C. Summary of Actions that have been Initiated by the Regional Board to Reduce Diazinon at Existing Hot Spot Sites and to Prevent the Creation of New Hot Spots (Cal. Water Code § 13394(h))

The initial characterization of the pesticide problem through extensive toxicity test, chemical and TIE work occurred in the Central Valley, with confirmation in the Bay Area. The follow-up studies identifying sources and loads has primarily occurred in the Bay Area and in the Sacramento urban area. The discovery of diazinon in urban storm runoff in both the Central Valley and San Francisco Bay Region at toxic concentrations to *Ceriodaphnia* led to the formation of the Urban Pesticide Committee (UPC). The objective of the UPC is to provide a forum for information exchange, coordination and collaboration on the development and implementation of an urban pesticide control strategy. An additional advantage of the Committee is that it facilitates a more efficient use of limited resources.

The UPC has prepared three reports describing various aspects of the urban pesticide problem in the Bay Area and a fourth volume describing a strategy for reducing diazinon levels in urban runoff. The first report provides a compilation and review of water quality and aquatic toxicity data in urban creeks and storm water discharges in the San Francisco Bay Area focusing on diazinon (Katznelson and Mumley, 1997). The review also includes a discussion of the potential adverse impact of diazinon on aquatic ecosystems receiving urban runoff. The second report characterizes the temporal and spatial patterns of occurrence of diazinon in the Castro Valley Creek watershed (Scanlin and Feng, 1997). Runoff at an integrator point for the entire watershed was sampled during multiple storms to record both seasonal and within-event variations in diazinon concentration. The purpose of the third report was to compile information on the outdoor use of diazinon in urban areas in Alameda County including estimates of quantity applied, target pests, and seasonal and long term trends (Scanlin and Cooper, 1997). This information will be used in the development of a strategy to reduce the levels of diazinon in Bay Area creeks. Finally, the UPC has produced a strategy for reducing diazinon levels in Bay Area creeks (Scanlin and Gosselin, 1997). Since pesticides are regulated on the state and national level, much of the strategy focuses on coordinating with enforcement agencies. The strategy presents a framework of roles and responsibilities that can be taken by various agencies to achieve the overall goal. The strategy focuses on diazinon as it is the most common insecticide detected at toxic levels. In the Central Valley both diazinon and chlorpyrifos are regularly observed and must be simultaneously addressed in any viable cleanup plan.

The Regional Board has been working with DPR, the cities of Sacramento and Stockton, interest groups and stakeholders to collect the information needed for development of the components of the TMDLs (required for 303(d) listings) for the discharges of pesticides from Sacramento and Stockton. Monitoring programs have been implemented and data is being evaluated to determine trends and sources of diazinon and chlorpyrifos entering the Delta. Staff has discussed with and received input from stakeholders on potential numeric water quality targets that would be appropriate for diazinon and chlorpyrifos in the Delta and main tributaries. Alternative implementation frameworks are being evaluated. Staff has worked with stakeholders and CALFED to see that projects are funded for development of alternative management practices that can be implemented to reduce urban discharges of pesticides to surface waters.

Following are additional specific actions taken by the Regional Board to address this hot spot.

US EPA Agreement with Manufacturers to Phase Out Urban Uses

Regional Board data and information was submitted to US EPA to support their efforts to reduce the urban uses.

Reevaluation of Stormwater Permits

In October and December 2002 respectively, the stormwater permits for the Stockton and Sacramento urban areas were revised and new requirements were imposed to assure that urban discharges do not continue to contribute to the hot spots. The new permits require

monitoring to document the effectiveness of the phase-out and require additional actions, as needed, to assure that the hot spots are not continued.

303(d) Listings of Impaired Water Bodies

The Regional Board has included several water bodies in the Stockton and Sacramento urban areas on the Clean Water Act 303(d) list of impaired water bodies and has established time schedules for addressing them.

Many other groups and entities are developing and implementing programs to reduce pesticide concentrations in urban stormwater runoff. Some of these activities are summarized below.

- The Sacramento Stormwater Program conducted a CALFED OP Pesticide Control Project grant study to evaluate OP pesticides in Sacramento area waterways from 1998 – 2001, including urban runoff, creeks, and rain concentrations.

- The Water Wise Pest Control Program is a cooperative effort promoting IPM to Sacramento residents through Master Gardener workshops, presentations, and plant clinics.

- During the 2001-02 program year, the Coalition for Urban/Rural Environmental Stewardship (CURES) gave pesticide control operator (PCO) outreach presentations. The presentations informed PCOs about the problems from pesticides contaminating urban runoff and waterways and methods to prevent this contamination from occurring.

D. Preliminary Assessment of Actions Required (Cal. Water Code § 13394(f))

As a result of agreements made in 2000 between US EPA and manufacturers of diazinon and chlorpyrifos, almost all non-agricultural uses are being phased out over the next several years. Therefore, this cleanup plan focuses on monitoring 1) to evaluate the trends in levels of diazinon and chlorpyrifos and any replacement products, 2) to determine the significance of rainfall contributions to the urban pesticide loads and 3) to determine the significance of the permitted urban uses that have not been phased out. Monitoring would be the joint responsibility of the cities and DPR and the Regional Board. Periodically, Regional Board staff will review monitoring results and make a recommendation to the Regional Board regarding the need for additional control actions.

This cleanup plan will be implemented through two primary actions: 1) developing Basin Plan amendments for controlling orchard dormant spray runoff (see Orchard Dormant Spray Cleanup Plan) in the Delta, Sacramento River and San Joaquin River and 2) amending the stormwater permits for the Sacramento and Stockton urban areas.

Impact of Orchard Dormant Spray Cleanup Plan on Urban Storm water Runoff

It is expected that Basin Plan amendments addressing dormant orchard spray applications will help reduce levels of diazinon and chlorpyrifos in rainfall either directly or because the implemented control program results in a decrease in use of the pesticides. These amendments, combined with the urban phase-out of diazinon and chlorpyrifos use is expected to eliminate or greatly reduce impairments from diazinon and chlorpyrifos in the urban creeks.

Strengthened Municipal Stormwater Permits Requirements for Affected Areas
New stormwater permits covering the Stockton and Sacramento urban areas were adopted in October and December 2002, respectively, that include findings, provisions and requirements that are needed to ensure compliance with Basin Plan provisions and to prevent maintenance or further pollution of existing hot spots. Specifically the permits do the following:

- require monitoring to evaluate the effectiveness of the phase-out of urban uses; require development of a management program for pesticides;
- require evaluation and determination by the Regional Board on program effectiveness; and
- establish numerical pesticide performance standards.

It is also anticipated that TMDLs that are consistent with Federal and State requirements will be established for the urban creeks. Additionally, if the diazinon and chlorpyrifos TMDLs and strengthened stormwater permits are not found to be effective in resolving the urban stormwater pesticide toxic hot spot, the Basin Plan will be revised to address urban stormwater.

Following is the time schedule for the above actions:

- Stormwater permits have been reevaluated and revised (October and December 2002)
- Basin Plan amendments for agriculture sources in the Sacramento River and San Joaquin River, including water quality objectives, implementation plan and time schedule, monitoring and load allocations (September 2003)[5]
- Basin Plan amendments for agriculture sources in the Delta, including water quality objectives, implementation plan and time schedule, monitoring and load allocations (September 2004)[6]

E. Estimated Costs of Implementing Control Program (Cal. Water Code § 13394(c))

The stormwater permits have already been adopted. Staff will need to conduct routine monitoring and inspections. These costs are already included in the Regional Board

[5] See diazinon dormant orchard spray cleanup plan for more details on the Sacramento River and San Joaquin River Basin Plan amendments.
[6] See diazinon dormant orchard spray cleanup plans for more details on the Delta Basin Plan amendments.

budget. Costs for monitoring to determine the effectiveness of the phase-out program will be borne largely by the stormwater dischargers in Sacramento and Stockton. DPR and Regional Board resources may be used to supplement monitoring and to evaluate the rainfall component. Continued monitoring in the urban area will be the responsibility of the dischargers. Costs associated with implementation of alternative management practices (aside from grants awarded for demonstration or pilot projects) in urban areas will be borne by entities regulated by the urban area permit programs. Educational programs and other programs to reduce pesticide use or promote use of alternative practices will be borne by stakeholders included in the implementation plans.

Following is an estimate of costs to implement the diazinon and chlorpyrifos urban stormwater runoff cleanup plan:

Task	Cost
DPR/Regional Board/urban entities costs to evaluate rainfall	$50,000 per year for three years
Monitoring costs for urban dischargers to define trends and evaluate urban sources	$50,000/yr in urban creeks
Continued practices evaluation	$50,000 to $100,000 for cities annually
Implementation of practices	No additional cost anticipated
Regulatory agency costs to oversee	$20,000 annually
RB staff costs to develop TMDL	$50,000 annually until 2005
RB staff costs to develop Basin Plan amendment (if needed)	$50,000/yr for two years

Although there are costs of implementing this cleanup plan, the benefits of remediation include the protection of beneficial uses in the Delta. Currently the high concentrations of diazinon and chlorpyrifos in the Delta are impacting the estuarine habitat (EST), migration of aquatic organisms (MIGR), spawning, reproduction and/or early development (SPWN), warm freshwater habitat (WARM), cold water habitat (COLD), water contact recreation (REC-1), non-contact recreation (Rec-2), and commercial and sport fishing (COMM) beneficial uses. Implementation of this plan will minimize or eliminate negative impacts on these uses. For more information on the benefits of restoring beneficial uses, see Table 1 in Volume 1 of the State Board's Toxic Hot Spots Cleanup Plan.

F. Estimate of Recoverable Costs from Potential Dischargers (Cal. Water Code § 13394(e))

The Regional Board, DPR and urban dischargers have spent considerable resources developing the information to support this clean-up plan. Continued costs will be incurred as all the above entities oversee development and implementation of programs. These costs are not recoverable. The cost of conducting the monitoring and implementing the clean-up plan will be largely borne by the urban dischargers in Sacramento and Stockton, DPR and entities that implement alternative pesticide management strategies. Fees are collected from the Sacramento and Stockton urban permittees (approximately $12,500 for the Stockton urban area and $25,000 for the Sacramento urban area) and these resources are used to oversee implementation of the permits.

The urban stormwater permits for the Sacramento and Stockton urban areas have already been adopted. The Regional Board has resources budgeted to implement cooperative monitoring programs with the urban stormwater entities. Resources are also available to develop TMDLs for the urban creeks.

G. Two Year Expenditure Schedule Identifying Funds to Implement the Plan that Are Not Recoverable From Potential Dischargers (Cal. Water Code § 13394(g))

The urban stormwater permits for the Sacramento and Stockton urban areas have already been adopted. The Regional Board has resources budgeted to implement cooperative monitoring programs with the urban stormwater entities. Resources are also available to develop TMDLs for the urban creeks, however costs incurred from TMDLs and Basin Plan amendments will be beyond the two year expenditure schedule.

Irrigation Return Flow Pesticide Cleanup Plan

Background[7]

The Regional Board determined that chlorpyrifos in irrigation return flow caused toxic conditions in various agriculturally dominated back sloughs within the Delta that warranted identifying Delta back sloughs as a candidate high priority toxic hot spot in 1999. The Consolidated Hot Spot Cleanup Plan adopted by the SWRCB in Resolution No. 99-065 identified this candidate hot spot as a known toxic hot spot.

Chlorpyrifos has also been noted in the Central Valley 303(d) list as a water quality impairment in the San Joaquin River, Sacramento-San Joaquin Delta and several other tributaries (see table below). This plan primarily addresses the cleanup requirements of the BPTCP but has also been written to be consistent with the proposed schedule for the 303(d) list.

303(d) List for Chlorpyrifos

Waterbody	Affected size	Priority	TMDL End Date
Arcade Creek	10 miles	High	2003
Chicken Ranch Slough	5 miles	High	2003
Delta Waterways	48,000 acres	High	2004
Elder Creek	10 miles	Medium	2003
Five Mile Slough	1 mile	Medium	2012
Harding Drain	7 miles	Low	After 2015
Merced River Lower	60 miles	High	2006
Mosher Slough	2 miles	Medium	2012
Orestimba Creek	10 miles	Medium	2010
Salt Slough	15 miles	Low	After 2005
San Joaquin River	130 miles	High	2003
Strong Ranch Slough	5 miles	High	2003

One and a half million pounds of chlorpyrifos active ingredient were used in the Central Valley on agriculture in 1990 (Sheipline, 1993). Major uses are in March on alfalfa and sugarbeets for weevil and worm control and between April and September on walnuts and almonds for codling moth and twig borer control. Two minor uses are on apples and corn. A toxicity test study was conducted in agriculturally dominated waterways in the San Joaquin Basin in 1991 and 1992. Chlorpyrifos was detected on 190 occasions

[7] The Bay Protection Program (California Water Code § 13394(a), (b) and (d)) require that the regional boards develop cleanup plans that include a priority ranking of all hot spots (§ 13394(a)), a description of the hot spots (§ 13394(b)), and an assessment of the most likely source(s) of the pollutants present at the hot spot site (§ 13394(d)). The information presented in this section was previously developed and included in the Statewide Consolidated Toxic Hot Spot Cleanup Plan adopted by the State Board. It is substantively unchanged (with the exception of the updated 303(d) listing information) but is presented for essential background information purposes.

between March and June of both years, at 43 times the toxic concentrations to *Ceriodaphnia* (Foe, 1995). Many of the crops grown in the San Joaquin Basin are also cultivated on Delta Tracts and Islands. Not known was whether these same agricultural practices might also contribute to instream toxicity in the Delta. BPTCP resources were used between 1993 and 1995 to conduct a toxicity monitoring program in the Delta. Chlorpyrifos toxicity was detected on nine occasions in surface water from four agriculturally dominated backsloughs (French Camp Slough, Duck Slough, Paradise Cut, and Ulatis Creek; Deanovic *et al*., 1996; Larson *et al*., 1994). In each instance the *Ceriodaphnia* toxicity test results were accompanied by modified Phase I and II TIEs and chemical analysis which implicated chlorpyrifos. On four additional occasions phase III TIEs were conducted (Ulatis Creek 21 March 1995, Paradise Cut 15 March 1995, Duck Slough 21 March 1995, and French Camp Slough 23 March 1995). These confirmed that chlorpyrifos was the primary chemical agent responsible for the toxicity. Analysis of the spatial patterns of toxicity suggests that the impairment was confined to back sloughs and was diluted away upon tidal dispersal into main channels. The precise agricultural crops from which the chemicals originated are not known because chlorpyrifos is a commonly applied agricultural insecticide during the irrigation season. However, the widespread nature of chlorpyrifos toxicity in March of 1995 coincided with applications on alfalfa and subsequent large rainstorms. Follow-up studies are needed to conclusively identify all responsible agriculture practices.

The Regional Board monitoring focused on *Ceriodaphnia* toxicity tests, TIEs and water column chemistry because these measures of aquatic toxicity were specifically identified in the BPTCP as tools that could be used to define toxic hot spots. The use of *Ceriodaphnia* in the BPTCP as an indicator of aquatic toxicity was an innovative and sound approach. An analysis of 49 independent studies (U.S. EPA, 1999) concluded that the *Ceriodaphnia* test has been a particularly reliable predictor of instream biological impacts. In 1995, the Society for Environmental Toxicology and Chemistry assembled a panel of experts to analyze the question of how reliably the results of laboratory single species tests (such as the U.S. EPA *Ceriodaphnia* toxicity test) predict aquatic population responses. The panel concluded that, "it is unmistakable and clear that when the U.S. EPA toxicity test procedures are used properly, they are reliable predictors of environmental impact provided that the duration and magnitude of exposure are sufficient to effect resident biota" and that "a strong predictive relationship exists between ambient toxicity and ecological impact."

A combination of toxicity test, chemical and TIE work demonstrate that chlorpyrifos was present periodically in at least four agriculturally dominated backsloughs at concentrations toxic to sensitive invertebrates. The source of the chlorpyrifos appears to be from agricultural use. These results led Regional Board staff to conclude that French Camp Slough, Duck Slough, Paradise Cut, and Ulatis Creek fit the BPTCP criteria for listing as candidate water column toxic hot spots because of elevated concentrations of chlorpyrifos.

Bay Protection Toxic Cleanup Program Guidance prepared by the State Board specifies how to determine what sites or situations should be designated as high priority toxic hot spots (cleanup plans are required for high priority hot spots). The criteria for making this

determination for water column hot spots include consideration of aquatic life impacts, exceedances of water quality objectives, the areal extent of the impairment, identification of sources and potential for natural remediation. Aquatic toxicity has been demonstrated to occur repeatedly through toxicity tests, TIEs and chemical confirmation. The extent of impairments from irrigation return flow is relatively widespread. This impairment will not be corrected by natural processes.

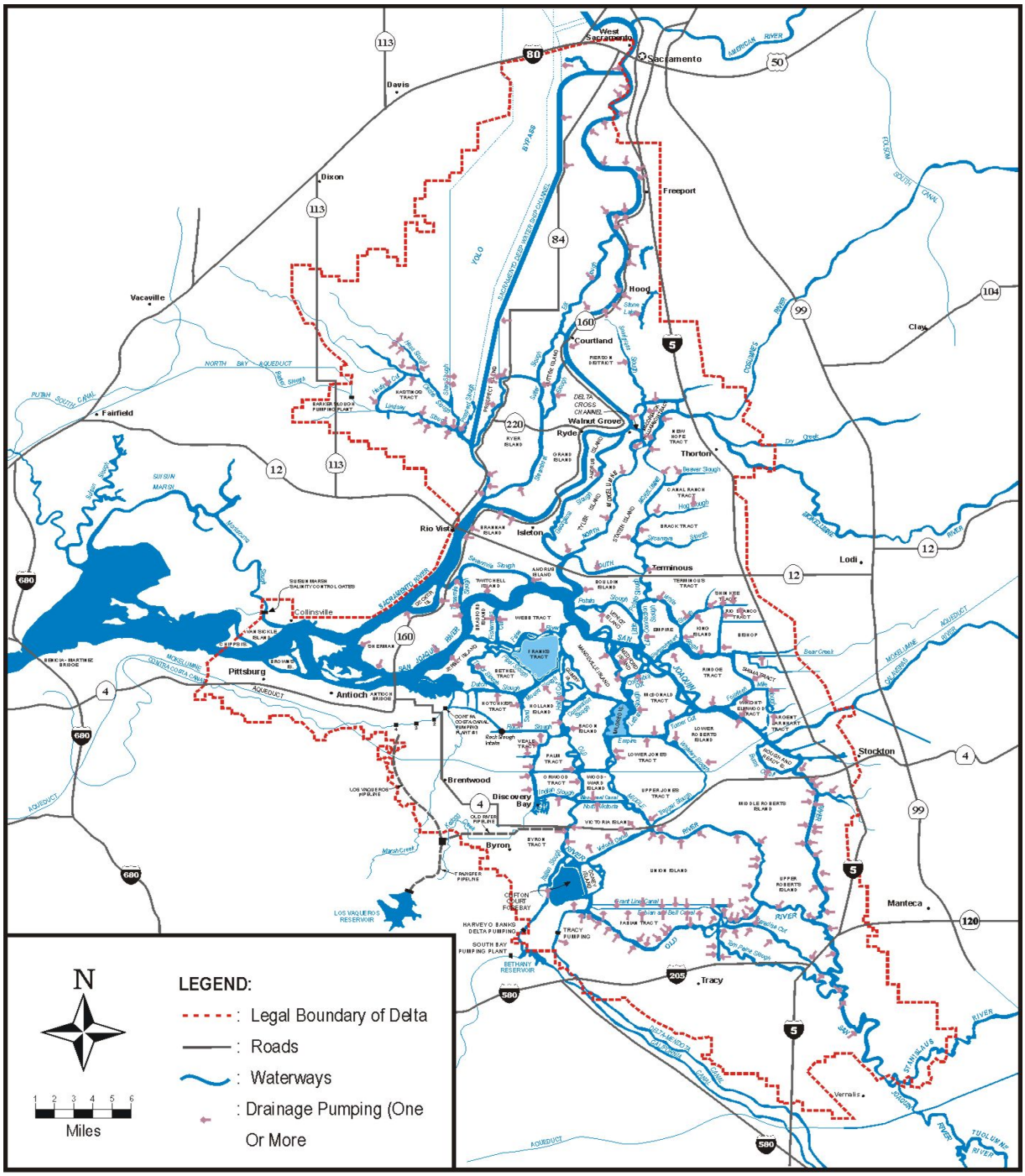
In 1999 the Regional Board determined that chlorpyrifos in agricultural return flow caused toxic conditions in numerous back sloughs in the Delta that warranted identifying these sloughs as a candidate high priority toxic hot spot. In making this determination, the Regional Board concluded that the pattern of pesticide detections observed in the sloughs was frequent and clearly fit the definition of a toxic hot spot. The 1999 State Board resolution adopting the Consolidated Hot Spot Cleanup Plan (Resolution No. 99-065) identified this candidate hot spot as a known toxic hot spot. The tables in the Statewide Consolidated Cleanup Plan (see pages 5-3 through 5-7) summarize the determinations that support the staff recommendation that the back sloughs in the Delta named above be listed as a high priority toxic hot spot for chlorpyrifos.

A. Areal Extent

For the Bay Protection Program, the potential aquatic threat posed by chlorpyrifos in agricultural return flow is confined to the four previously named Creeks and Sloughs: French Camp Slough, Duck Slough, Paradise Cut and Ulatis Creek. The areal extent of the impairment may be up to 15 linear miles of waterway within the legal boundary of the Delta. See attached map.

B. Sources

The only major use of chlorpyrifos in these four drainage basins is on agriculture. Detailed follow-up studies are needed to determine the crop and precise agricultural practice which led to the off-site movement. While it is not known at this time what the relative contribution of each application is, illegal use of pesticides has not been implicated as a significant component of the loads entering surface waters. It would appear that legal use of the pesticide is resulting in the observed water quality problems.



Sacramento/San Joaquin River Delta
(Source: California Department of Water Resources)

C. Summary of Actions that have been Initiated by the Regional Board to Reduce Chlorpyrifos at Existing Hot Spot Sites and to Prevent the Creation of New Hot Spots (Cal. Water Code § 13394(h))

The Regional Board has been involved in activities to address water quality problems associated with chlorpyrifos in the Delta and tributaries to the Delta for more than 15 years, including, implementing comprehensive monitoring programs, revising CWA 303(d) listings of impaired water bodies, revising NPDES permit specifications, and working with DPR and watershed groups and stakeholders.

Regional Board Monitoring

- Comprehensive monitoring identified chlorpyrifos as a basin wide water quality problem, 1986-1994.
- Since 1994, the Regional Board has participated in cooperative monitoring efforts with DPR and others.

303(d) Listings of Impaired Water Bodies

- The Delta, San Joaquin River, and several tributaries have been placed on the 303(d) list of impaired waterbodies for elevated concentrations of chlorpyrifos.
- Total Maximum Daily Loads (TMDLs) are required for all listed waterbodies.
- The Regional Board has established time schedules to develop TMDLs for the rivers and Delta and has initiated meeting with stakeholders and interested parties.

NPDES Permit Revisions

- A letter was sent in 2002 to all significant NPDES Permittees requiring monitoring of effluent discharges and receiving waters for diazinon and chlorpyrifos.
- Waste discharge requirements for municipal wastewater discharges have been re-evaluated as the permits reach the five-year expiration date. Where monitoring data indicate that there is reasonable potential for diazinon or chlorpyrifos to cause receiving water toxicity, effluent limitation are included in the NPDES Permit. (For example, the April 2002 NPDES Permit renewal for the City of Stockton wastewater treatment plant included an effluent limitation for diazinon.)
- Stormwater permits for Sacramento and Stockton urban areas have been re-evaluated and strengthened to require monitoring and chlorpyrifos control programs to insure that urban sources do not contribute to the hot spot.

Watershed Management Initiative

- The Watershed Management Initiative (WMI) directs state and federal funds to the highest priority activities and to assure coordination with other agencies and parties.
- The Regional Board has identified chlorpyrifos as a high priority water quality problem in the WMI.

CALFED and other Grant Programs

- The Regional Board has successfully obtained state and federal grant funding for management practice development projects.
- The Regional Board has also worked with CALFED to ensure that the Record of Decision included chlorpyrifos as a high priority problem that needs to be addressed.

Department of Pesticide Regulation Coordination

In 1997, the Department of Pesticide Regulation (DPR) and the State Board signed a management agency agreement (MAA) and a companion document, the Pesticide Management Plan for Water Quality (Pesticide Management Plan), These documents were developed, in part, to provide the framework for using each agencies authorities to effectively address water quality problems associated with pesticides. The Regional Board has worked with DPR to implement monitoring programs and to support programs that evaluate management practice effectiveness.

DPR will consider regulatory options to improve water quality impaired by pesticides in irrigation return flows. These options may include reevaluation as a means to obtain information from pesticide registrants on practices for reducing pesticides from return flows. They may also include requiring growers to obtain pesticide use permits from county agricultural commissioners. If permits were to be issued, they may be conditioned to reduce the likelihood that pesticides leave the application site via irrigation return flows.

Watershed and Stakeholder Groups

The Regional Board has been working with DPR, interest groups and stakeholders to collect the information needed for development of the components of the TMDLs. The State's Nonpoint Source Program also funds active participation in many watershed groups working on pesticide issues, and state and federal grant projects that staff manage also allows staff to keep abreast with watershed/stakeholder activities. Staff has also partnered with other agencies and programs to maximize available resources for monitoring programs, computer models, workshops, and education and outreach efforts. Two activities by other entities are underway in the Central Valley to develop BMPs to reduce pesticide movement into surface water. Each is summarized below.

- The U.C. Statewide Integrated Pest Management Project was awarded a CALFED grant in order to identify alternate urban and rural BMP practices, provide

outreach and education on these new practices, and design and initiate a monitoring program to assess the success of the new practices.

- DowElanco (now DowAgro Sciences), the registrant of chlorpyrifos, has undertaken a multi year study in Orestimba Creek to identify the specific agricultural use patterns and practices which contribute the majority of the off-site movement of their product into surface water.

D. Preliminary Assessment of Actions Required (Cal. Water Code § 13394(f))

Controlling the loads of chlorpyrifos entering the Delta from the San Joaquin River is expected to prevent impairments in the main water masses in the Delta that in the past have been associated with in-season applications. Additional work will be needed to evaluate other in-Delta sources and other tributaries (such as the Mokelumne River and the Yolo Bypass) and develop control programs for these sources, if warranted. The Basin Plan amendment for the Delta will describe how monitoring results will be evaluated and how impairments in the back sloughs will be addressed. In evaluating implementation program options, Regional Board staff will consider all alternatives that are appropriate under state and federal laws and regulations, including use of waste discharge requirements.

This cleanup plan is designed to address the seasonal water column toxicity problem that occurs as a result of applications of chlorpyrifos. This cleanup plan is different than cleanup plans developed in other parts of the state to remediate toxic sediment, a problem that can be addressed by traditional cleanup activities such as burying, dredging and hauling to remedy the problems. This seasonal water column hot spot cannot be addressed by hauling away the water or the underlying sediment. . Instead, like the preceding cleanup plans, this cleanup plan must rely on controlling the amounts of the chemicals that reach surface waters entering the Delta. Therefore, the cleanup plans focuses on source control, either by reduction of the use of the chemicals or by implementation of use and management practices that reduce or eliminate the discharge of chlorpyrifos into surface waters.

This cleanup plan identifies actions the Regional Board may take to establish a regulatory framework that will require implementation of a suite of management practices or measures to assure that irrigation return flow discharges do not continue to cause or contribute significantly to the hot spot. The regulatory frameworks and associated costs outlined in this cleanup plan are included here for informational purposes. These are examples of potential actions the Board may take when implementing TMDLs and Basin Plan Amendments and should not be construed as initiating or dictating action at this time. This cleanup plan does set a time schedule for the Regional Board to make important regulatory revisions to the Basin Plan.

This cleanup plan establishes a time schedule for the Regional Board to adopt TMDLs, and to adopt Basin Plan amendments to implement the TMDLs. This cleanup plan requires that the Regional Board approve the TMDLs and consider amendments to the Basin Plan by September 2003 for the San Joaquin River and by September 2004 for the

Delta and adopt amendments to the Basin Plan no later than December 2003 and December 2004 respectively[8].

Basin Plan Amendment Schedule

Waterway	Schedule	Date
San Joaquin Rivers	Technical reports circulated for peer review; includes preliminary staff analysis on water quality objectives and implementation alternatives	March 2003
San Joaquin Rivers	Proposed basin plan amendments given to the Regional Board for consideration. Amendments will include: – water quality objectives for chlorpyrifos; – an implementation program and framework; – a compliance time schedule; – a monitoring program; and – other required TMDL elements.	September 2003
San Joaquin Rivers	Adopt Basin Plan Amendments	December 2003
Delta	Technical reports prepared that includes preliminary staff analysis on water quality objectives and implementation alternatives	September 2003
Delta	Proposed Basin Plan amendments given to the Regional Board for consideration. Amendments will include: – water quality objectives for chlorpyrifos; – an implementation program and framework; – a compliance time schedule; – a monitoring program; and – other required TMDL elements.	September 2004
Delta	Adopt Basin Plan Amendments	December 2004
Delta and Upstream	Monitor chlorpyrifos concentrations in surface waters in the Delta and upstream inputs.	Annually

TMDLs will be developed for chlorpyrifos in the San Joaquin River and Delta. The TMDLs will include a TMDL staff report that describes the impairment, identifies an appropriate water quality target, determines the loading capacity and allocates loads (including a margin of safety). The TMDL load allocations are implemented by amending the Basin Plan to include the regulatory provisions of the TMDL (water quality

[8] The time schedules set forth herein express the Board's intent and may need to be revised depending on future funding levels and developments that occur in the separate public proceedings for considering adoption of TMDLs and Basin Plan amendments.

objective, load allocations and margin of safety) together with an implementation program and time schedule. The TMDLs are adopted when the Regional Board adopts the Basin Plan amendments that implement the load allocations. The cleanup plan requires that these amendments contain:

- numeric water quality objectives for chlorpyrifos for the San Joaquin River and the Delta
- load allocations including a margin of safety
- a time schedule for compliance with the objectives and allocations
- a program of implementation that is based on the regulatory options contained in Porter-Cologne (i.e., individual WDRs, areawide or group WDRs, conditional prohibitions, conditional waivers)
- monitoring requirements to evaluate program effectiveness

This cleanup plan also reaffirms the Board's commitment and time schedule for adopting TMDLs for the San Joaquin River and the Delta. It also reaffirms the Board's commitment to continue to work with watershed groups, DPR, the agricultural commissioners, and other stakeholders.

Basin Plan amendments and TMDLs typically take two to three years to develop. The reason that the proposed time schedule set forth above can be met is that development of the TMDL and Basin Plan amendments are already underway (they started two years ago). However, this time schedule cannot be shortened further because of requirements for public review and response to comments and CEQA.

The Basin Plan amendments that are required by the cleanup plans will implement actions previously missing (BMPs and other source control options) in order to correct the hot spots. The Regional Board cannot specify what specific practices should be implemented. The Regional Board can specify through a Basin Plan amendment what water quality conditions need to be met, by when they must be met, and what type of information must be submitted to determine compliance.

The implementation framework that will be included in the Basin Plan will be based on Regional Board regulatory authorities that are included in Porter-Cologne. Porter-Cologne describes three primary mechanisms to regulate the discharge of waste:

1. prohibiting discharge of waste (a "prohibition" under § 13243 of Porter-Cologne)
2. issuance of requirements for the discharge of waste (waste discharge requirements (WDRs) under § 13263 of Porter-Cologne)
3. waiver of waste discharge requirements (a "waiver" under § 13269 of Porter-Cologne)

Prohibitions and waivers of waste discharge requirements can be developed that specify conditions under which discharges may be allowed. The conditions can include a wide array of provisions geared toward assuring that waste discharges do not cause water quality problems.

E. Estimated Costs of Implementing Control Program Cal. Water Code § 13394(c))

The primary costs of implementing this program are 1) costs to the Regional Board to develop and process the Basin Plan amendments, including monitoring and preparation of staff reports, 2) costs to the Regional Board to implement the regulatory program that is developed through the Basin Planning process, 3) costs to other entities (DPR, agricultural commissioners, watershed groups, irrigation districts, etc.) that would be part of the regulatory framework, 4) cost to growers to implement practices to reduce pesticide runoff and to submit information required as part of the regulatory program, 5) costs associated with the continuing need to develop and evaluate management practices, and 6) monitoring costs to evaluate program effectiveness. In the following table, costs are estimated for these 6 elements. More detailed information on the costs is presented following the table for each of the elements.

Task	Cost
Regional Board staff costs to develop Basin Plan proposal	$100,000 FY 2002-2003* $100,000 FY 2003-2004*
Regional Board costs to oversee (Depends on regulatory framework)	$540,000 -$1.8 million annually
Costs to other entities to oversee	$0-$300,000 annually
Costs to Growers	
Implementation of practices (Depends on alternatives selected)	See Below
Regulatory Compliance	$555 to $8,200 per grower annually
Continued practices development	$100,000 to $1,000,000 per year
Monitoring for program effectiveness	$100,000/yr in Delta only

Regional Board Staff Costs to Develop Basin Plan Amendment

Although the Regional Board has worked on this pesticide problem for many years, it was not until 1998 that resources were specifically designated for this program. The cost estimates presented here are for FY 2002-2003 and FY 2003-2004. Basin Plan amendments are scheduled for consideration in September 2003 for the San Joaquin River and September 2004 for the Delta. It is estimated that the costs for FY 2002-2003 would be about $100,000 and the costs for FY 2003-2004 would be about $100,000. The information is excerpted from program workplans. The cost estimates include staff time to develop the amendment package, including evaluating alternative water quality objectives and implementation frameworks and costs associated with monitoring and

analysis of monitoring information. The Regional Board has resources budgeted to conduct the monitoring and the planning needed to support development of the Basin Plan amendments.

Regional Board Costs of Regulatory Oversight

As has been previously indicated, the Regional Board has three primary mechanisms that could be used to regulate the discharge of waste from agricultural sources. The mechanisms are 1) prohibiting the discharge of waste (a "prohibition" under § 13243 of Porter-Cologne); 2) issuing requirements for the discharge of waste (waste discharge requirements or WDRs under § 13263 of Porter-Cologne); and 3) waiving waste discharge requirements (a "waiver" under § 13269 of Porter-Cologne). Therefore, we have presented a range of cost estimates that account for the relative level of Regional Board oversight that would be required under the different options. The estimates are based on costs associated with previous Regional Board regulatory efforts for rice pesticide in the Sacramento River watershed and selenium in the San Joaquin River watershed and information presented in the Regional Board staff report on agricultural waivers that was presented to the Regional Board in December 2002. However, these costs are based on the development of regulatory oversight for one parameter (chlorpyrifos) in smaller backsloughs. The oversight will be less time consuming and costly than a more comprehensive regulatory program for multiple parameters such as those outlined in the agricultural waivers. The estimated annual cost to the Regional Board to implement this program would range from about $540,000 to $1.8 million depending on which regulatory framework is used. Following is more detailed information about each alternative.

For purposes of these cost estimates, we assume that there are about 1800 growers that apply chlorpyrifos in the Delta and watersheds tributary to the Delta. If individual waste discharge requirements were used, we assume that it would take one staff to handle 100 permits. Typical annual staff costs average about $100,000. This would include activities associated with adopting waste discharge requirements over a 5 year period for the 1800 growers that apply chlorpyrifos during the irrigation season, review of information and monitoring reports submitted by dischargers and doing a baseline amount of inspections, monitoring and enforcement. The annual cost would be about $1.8 million (9staff x $100,000 to adopt WDRs and 9 staff x $100,000 to review information, monitor, inspect and enforce).

The costs for the Regional Board to use general WDRs (assumes one set of WDRs covers entire Bay-Delta watershed) would be less expensive than using individual WDRs because we assume that it would take less staff effort to develop and adopt one general WDR rather than 1800 separate WDRs. We assume that a similar level of activity would be needed to review information and monitoring reports submitted by dischargers and performing a baseline number of inspections, monitoring and enforcement (compared to individual WDRs), because there still are the same 1800 dischargers to work with. Therefore, the annual costs are estimated to be about $900,000 annually (9 staff x $100,000).

The costs to the Regional Board to use areawide WDRs (separate WDRs that covers smaller subwatersheds within the larger Bay-Delta watershed) would be slightly less than using general WDRs because we assume that some watershed groups, irrigation districts or other entities would be formed to take responsibility for managing and digesting information developed by individual growers. The Regional Board would therefore need to work with a relatively small number of entities, instead of 1800 individual growers. This would reduce Regional Board oversight costs, but there would be additional costs to entities accepting responsibility for the areawide waste discharge requirements. The annual costs are estimated to be about $540,000. There would be additional costs to entities participating in the program.

Costs to the Regional Board to use a conditional waiver or prohibition would be similar to a general WDRs if the Regional Board works with all 1800growers or would be similar to the areawide WDRs if the growers formed watershed groups.

Cost to Other Entities for Regulatory Oversight

We estimate that the costs to other entities (DPR, agricultural commissioners, watershed groups, irrigation districts, etc.) would range from almost nothing to about $300,000 annually depending on the alternative selected.

Cost to Growers

There are three types of costs to the grower: 1) the cost to implement practices to reduce pesticide runoff, 2) the cost associated with gathering and submitting information to fulfill waste discharge requirement or other conditions and 3) any WDR permit fee that might be required.

Cost of Practice Implementation

The choice of alternative practices to be implemented will be up to individual growers. Valley-wide implementation costs will be dependent on the mix of practices selected. Alternative management practices for irrigation return flow includes vegetating irrigation canal banks with native plants which reduces erosion and off site movement of pesticides and nutrients, while enhancing biological diversity and aesthetics (Yolo County RCD, 1999). The cost of vegetating one mile of irrigation canal on both sides is estimated to be about $2,695-$7,747. Another effective management practice is to install tailwater ponds. Tailwater ponds catch and store runoff water while preventing non-point source pollution from reaching surface waters and allows for pesticides to degrade naturally. Approximately, 1 acre per 100 acre field is needed for the pond(s) and the estimated costs for installing a tailwater pond is $3,3730 -$11,525 plus the cost of taking land out of production to construct the ponds. The most effective tailwater ponds for irrigation water management include return flow systems which captures the tailwater and re-circulates it for further irrigation while preventing offsite runoff. Minimum costs for tailwater ponds with return flow systems are estimated to be between $13,580 and $27,555 (Yolo County RCD, 1999). Depending on the individual grower's choice of practices to be implemented, valley-wide implementation costs will vary.

Cost of Regulatory Compliance

If use of individual WDRs is the regulatory framework selected, each grower could be required to submit a filing fee. Considering the existing filing fee schedule and category descriptions, staff estimates that annual filing fees would be approximately $2,025. We assume that monitoring, reports and other information would need to be submitted by all growers. We estimate that the cost for each grower to submit information required to satisfy the WDRs would be about $6,175 annually, for a total of $8,200 a year. We assume that other options that would rely on formation of subwatershed groups to coordinate activities would cost less because the level of detail submitted from each grower would not be as great and there would be savings on implementing areawide monitoring programs rather than having monitoring at each orchard. In the event that waste discharge requirements are waived, all or part of the fees collected will be returned to the discharger, in accordance with Water Code section 13260(e) and 23 California Code of Regulations (CCR) 2200.4. However, the filing fees may not be required and could be subtracted as a cost. We estimate that using a watershed approach could cost as little as about $555 per grower annually.

Although there are costs of implementing this cleanup plan, the benefits of remediation include the protection of beneficial uses in the Delta. Currently the high concentrations of diazinon and chlorpyrifos in the Delta are impacting the estuarine habitat (EST), migration of aquatic organisms (MIGR), spawning, reproduction and/or early development (SPWN), warm freshwater habitat (WARM), cold water habitat (COLD), water contact recreation (REC-1), non-contact recreation (Rec-2), and commercial and sport fishing (COMM) beneficial uses. Implementation of this plan will minimize or eliminate negative impacts on these uses. For more information on the benefits of restoring beneficial uses, see Table 1 in Volume 1 of the State Board's Toxic Hot Spots Cleanup Plan.

F. Estimate of Recoverable Costs from Potential Dischargers (Cal. Water Code § 13394(e))

The Regional Board, DPR and other agencies and parties have spent considerable resources developing the information to support this cleanup plan. These costs are not recoverable. As has been mentioned in the previous section, the cost of implementing the cleanup plan will be largely borne by the farmers using alternative practices and the regulatory agencies that must oversee control program implementation.

Regulatory oversight costs could be recovered if waste discharge requirements are part of the regulatory framework that is developed. If individual requirements are issued, based on the cost estimates provided in the previous section, approximately $3.6 million could be recovered annually. Costs recovered by areawide or general waste discharge requirements would dependent on the population covered by the requirements. In the event that waste discharge requirements are waived, the Regional Board could elect to withhold sufficient funds collected with a filing of waste discharge to cover the actual staff time spent reviewing the report of waste discharge (as set forth in the California Code of Regulations). These costs were estimated by assuming that there are about 1800

growers in the Sacramento and San Joaquin River watersheds that apply chlorpyrifos during the irrigation season, assuming that the Regional Board would have to deal with all of them, and using the existing fee schedule to estimate the appropriate fee that would be applicable (in this case $2,025).

G. Two Year Expenditure Schedule Identifying Funds to Implement Plan That Are Not Recoverable From Potential Dischargers (Cal. Water Code § 13394(g))

The Regional Board has a TMDL budget and a workplan that includes resources to monitor and develop the Basin Plan amendment proposals for the San Joaquin River in FY 2002 and 2003. Resources are also earmarked for FY 2003-2004 for completion of the Basin Plan amendments for the Delta.

Resources to support the Regional Board regulatory framework have not been identified and are dependent on what regulatory framework is chosen. If WDRs are used, then the program can be supported by WDR fees. If other options are used, funding sources will need to be identified. One option may be to request budget augmentations. Most of the costs to the Regional Board and other regulatory entities would occur beyond the two year budget outlooks included under this section, since the Basin Plan amendments will not be completed until 2004.

Costs of implementation practices will primarily be borne by growers. However, there are many cost sharing (NRCS Environmental Quality Incentives Program (EQIP)) funds available to defray the costs associated with implementing new management practices. Additionally several of the possible alternatives would result in cost savings. There are also several state and federal grant programs available to conduct research and monitoring to analyze management practice implementation, water quality improvement and management practice development, as well as education and outreach projects. These funding sources include the Clean Water Act Sections 319(h) and 205(j), Proposition 13 (including the Pesticide Research and Investigation of Source, and Mitigation (PRISM)), Program, 40 and 50 funds, and the CALFED Bay-Delta Program.

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